OROVILLE FERC RELICENSING
(PROJECT NO. 2100)

INTERIM REPORT
SP-F3.2 TASK 2
SP-F21 TASK 1

APPENDIX A
MATRIX OF LIFE HISTORY AND HABITAT REQUIREMENTS FOR FEATHER RIVER FISH SPECIES

LITERATURE REVIEW OF LIFE HISTORY AND HABITAT REQUIREMENTS FOR FEATHER RIVER FISH SPECIES

REDEYE BASS

JANUARY 2003

Element	Element Descriptor	General	Feather River Specific
General			
common name (s)	English name (usually used by fishers and laypeople).	Redeye Bass Redeye bass were previously considered a small form of smallmouth bass (Moyle 2002).	
scientific name (s)	Latin name (referenced in scientific publications).	*Micropterus coosae*	
taxonomy (family)	Common name of the family to which they belong. Also indicate scientific family name.	Sunfish and bass - *Centrarchidae*	
depiction	Illustration, drawing or photograph.		
range	Broad geographic distribution, specifying California distribution, as available.	Redeye bass are native to the headwaters of the Savannah, Altahama, and Mobile River basins in Georgia, Alabama, North Carolina, and South Carolina, and were introduced into California and Puerto Rico (Moyle 2002).	
native or introduced	If introduced, indicate timing, location, and methods.	In 1962 and 1964, bass from Tennessee and Georgia were planted in Alder Creek, the south fork of the Stanislaus River, Dry Creek, Santa Ana River, Sisquoc River, and the Santa Margarita River (Moyle 2002).	In 1969, redeye bass was introduced from the California Department of Fish and Game Central Valley hatchery into Oroville Reservoir (Moyle 2002).

Element	Element Descriptor	General	Feather River Specific
ESA listing status	Following the categories according to California Code of Regulations and the Federal Register, indicate whether: SE = State-listed Endangered; ST =State-listed Threatened; FE = Federally listed Endangered; FT = Federally-listed Threatened; SCE = State Candidate (Endangered); SCT = State candidate (Threatened); FPE = Federally proposed (Endangered); FPT = Federally proposed (Threatened); FPD = Federally proposed (Delisting); the date of listing; or N = not listed.	Redeye bass are not listed.	
species status	If native, whether: Extinct/extirpated; Threatened or Endangered; Special concern; Watch list; Stable or increasing. If introduced, whether: Extirpated (failed introduction); highly localized; Localized; Widespread and stable; Widespread and expanding.	The status of redeye bass is “limited distribution,” however this rating may be conservative because their takeover of large stretches of the Cosumnes River indicates that they are capable of invading many foothill streams in the Central Valley (Moyle 2002).	
economic or recreational value	Indicate whether target species sought for food or trophy. Whether desirable by recreational fishers, commercial fishers, or both.	Redeye bass have recreational value, although most California anglers do not know they exist and they are rather small and slow growing for a game fish (Moyle 2002).	
warmwater or coldwater	Warmwater if suitable temperature range is similar to basses; coldwater if suitable temperature range is similar to salmonids.	Redeye bass are warmwater fish.	
pelagic or littoral	Environment: Pelagic - living far from shore; Littoral - living near the shore.		
bottom or water column distribution	Environment: bottom (benthic) or along water column.		

Element	Element Descriptor	General	Feather River Specific
lentic or lotic	Environment: Lentic - pertaining to stagnant water, or lake-like; Lotic - moving water, or river-like.	Redeye bass are freshwater fish and are adapted for living in small, clear, upland streams (Moyle 2002).	
Adults			
life span	Approximate maximum age obtained.		
adult length	Indicate: Length at which they first reproduce; average length and maximum length the fish can attain.	Redeye bass are slow-growing in streams, reaching 1.8 to 2.6 inches (4.5 to 6.5 cm) in length in the first year, averaging as little as 0.8 to 1.2 inches per year (2 to 3 cm/year), and taking 9 to 10 years to reach 9.8 inches (25 cm) in length. It is likely that redeye bass over 13.8 inches (35 cm) long are smallmouth-redeye bass hybrids (Moyle 2002). In the Cosumnes River, the largest redeye bass observed measured 9.8 to 11.8 inches (25 to 30 cm) long, and was about 5 or 6 years old (Moyle 2002). Redeye bass reach sexual maturity at about 4.7 to 5.1 inches (12 to 13 cm) in length, or approximately 2 to 4 years of age (Moyle 2002).	In Oroville Reservoir, redeye bass grow fairly rapidly, reaching about 2.8 to 3.2 inches (7 to 8 cm) in their first year, 3.5 to 4.3 inches (9 to 11 cm) in their second year, and 4.7 to 5.5 inches (12 to 14 cm) in their third year (Moyle 2002). In Oroville Reservoir, redeye bass up to 16.1 inches (41 cm) have been recorded, but they are likely smallmouth-redeye hybrids (Moyle 2002).
adult weight	Indicate: Weight at which they first reproduce; average weight and maximum weight the fish can attain.		
physical morphology	General shape of the fish: elongated, fusiform, laterally compressed, etc.		
coloration	Indicate color, and color changes, if any, during reproduction phase.	Redeye bass are brightly colored with a distinct purplish or greenish cast to the sides, a distinct white band on the upper and lower edges of the caudal fin, and reddish eyes (Moyle 2002).	
other physical adult descriptors	Unique physical features for easy identification.	Redeye bass appear strongly patterned, including irregular blotching on the back (Moyle 2002).	
adult food base	Indicate primary diet components.	Redeye bass depend heavily on terrestrial insects, and also aquatic insects, fish, crayfish, and salamanders (Moyle 2002).	

Element	Element Descriptor	General	Feather River Specific
adult feeding habits	Indicate whether plankton eater, algae eater, bottom feeder, piscivorous, active hunter, ambush predator, filter feeder. Night, day, dusk or dawn feeder.	Redeye bass are opportunistic predators that feed on the surface, in the water column, and on the bottom. Redeye bass are voracious predators that can either actively hunt or ambush prey, and are capable of rapid rushes in pursuit of prey (Moyle 2002).	
adult in-ocean residence time	For anadromous species, age when they migrate to the ocean and duration spent in the ocean before returning to freshwater to spawn.	N/A	
adult habitat characteristics in-ocean	For anadromous species, description of the ocean habitat utilized: whether along major current systems, gyres, pelagic (beyond continental shelves) and neritic (above continental shelves) zones, etc.	N/A	
Adult upstream migration (immigration)			
range of adult upstream migration timing	Time of year adults migrate upstream. If applicable, indicate for various runs.	N/A	
peak adult upstream migration timing	Time of year most adults migrate upstream. If applicable, indicate for various runs.	N/A	
adult upstream migration water temperature tolerance	Range of water temperatures allowing survival. Indicate stressful or lethal levels.	N/A	
adult upstream migration water temperature preference	Range of suitable, preferred or reported optimal water temperatures. Indicate whether literature, observational, or experimental.	N/A	
Adult holding (freshwater residence)			
water temperature tolerance for holding adults	Range of water temperatures allowing survival. Indicate stressful or lethal levels.		

Element	Element Descriptor	General	Feather River Specific
water temperature preference for holding adults	Range of suitable, preferred or reported optimal water temperatures. Indicate whether literature, observational, or experimental.	In clear and warm streams of California where summer water temperatures reach 78.8°F to 82.4°F (26°C to 28°C), redeye bass are typically one of the most abundant fish (Moyle 2002).	
water depth range for holding adults	Reported range of observed (minimum and maximum) water depth utilization.		
water depth preference for holding adults	Reported range of most frequently observed water depth utilization.		
substrate preference for holding adults	If bottom dwellers, indicate substrate: mud, sand, gravel, boulders, aquatic plant beds, etc. If gravel, indicate range or average size of gravel.	Redeye bass favor pools, pockets of water near boulders, and undercut banks (Moyle 2002).	
water velocity range for holding adults	Reported range of observed (minimum and maximum) water velocity utilization.		
water velocity preference for holding adults	Reported range of most frequently observed water velocity utilization.		
other habitat characteristics for holding adults	General description of habitat (e.g. turbid or clear waters, lentic or lotic, presence of aquatic plant beds, debris, cover, etc.).		
timing range for adult holding	Time of year (earliest-latest) and duration of stay from upstream migration to spawning.		
timing peak for adult holding	Time of year when maximum number of adults are present before spawning.		
Spawning			
fecundity	Average or range in the number of eggs females lay in a spawning season.	Redeye bass fecundities are high relative to its size, and number 2,084 to 2,334 eggs in females measuring 5.9 and 8.3 inches (15 and 21 cm), respectively (Moyle 2002).	

Element	Element Descriptor	General	Feather River Specific
nest construction	Location and general description of nest -- substrates, aquatic plants, excavations, crevices, habitat types, etc.	Male redeye bass construct nests in beds of gravel (Moyle 2002).	
nest size	Size and average dimensions of the nest.		
spawning process	Indicate whether nest builder, broadcast spawner, or other.	Redeye bass spawning and parental behavior is similar to smallmouth bass (Moyle 2002).	
spawning substrate size/characteristics	Range of substrates used during spawning (e.g. mud, sand, gravel, boulders, beds of aquatic plants). Indicate presence of plant/wood debris, crevices at spawning sites. If gravel, indicate range of average size.		
preferred spawning substrate	Indicate preferred spawning substrate (e.g. mud, sand, gravel, boulders, plant bed, etc).		
water temperature tolerance for spawning	Range of water temperatures allowing survival. Indicate stressful or lethal levels.	Redeye bass move up small tributary streams or to the heads of pools in larger streams to spawn in late spring when water temperatures rise to 62.6°F to 69.8°F (17°C to 21°C) (Moyle 2002).	
water temperature preference for spawning	Range of suitable, preferred or reported optimal water temperatures. Indicate whether literature, observational, or experimental derivation.		
water velocity range for spawning	Minimum and maximum speed of water current the spawning fish can tolerate.		
water velocity preference for spawning	Preferred water current (flow velocity) during spawning.		
water depth range for spawning	Reported range of observed (minimum and maximum) water depth utilization.		

Element	Element Descriptor	General	Feather River Specific
water depth preference for spawning	Reported range of most frequently observed water depth utilization.		
range for spawning timing	Earliest and latest time of season or year in which spawning occurs.	Redeye bass spawn in late spring when water temperatures rise to 62.6°F to 69.8°F (17°C to 21 °C) (Moyle 2002).	
peak spawning timing	Time of year most fish start to spawn.		
spawning frequency (iteroparous/semelparous)	Semelparous - producing all offspring at one time, such as in most salmon. Usually these fish die after reproduction. Iteroparous - producing offspring in successive, e.g., annual or seasonal batches, as is the case in most fishes.	Redeye bass are iteroparous spawners (Moyle 2002).	
Incubation/early development			
egg characteristics	Shape, size, color, in clusters or individuals, stickiness, and other physical attributes.		
water temperature tolerance for incubation	Range of water temperatures allowing survival. Indicate stressful or lethal levels.		
water temperature preference for incubation	Range of suitable, preferred or reported optimal water temperatures. Indicate whether literature, observational, or experimental derivation.		
time required for incubation	Time duration from fertilization to hatching. Note: Indicate at which temperature range. Incubation time is temperature-dependent.		
size of newly hatched larvae	Average size of newly hatched larvae.		
time newly hatched larvae remain in gravel	Time of year of hatching, and duration between hatching and emergence from gravel.		

Element	Element Descriptor	General	Feather River Specific
other characteristics of larvae	Alevin -- early life history phase just after hatching (larva) when yolk-sac still present.		
timing range for emergence	Time of year (earliest-latest) hatchlings (larvae and alevins) leave or emerge from the nesting/hatching (gravel) sites.		
timing peak for emergence	Time of year most hatchlings emerge.		
size at emergence from gravel	Average size of hatchlings at time of emergence.		
Juvenile rearing			
general rearing habitat and strategies	General description of freshwater environment and rearing behavior.		
water temperature tolerance for juvenile rearing	Range of water temperatures allowing survival. Indicate stressful or lethal levels.		
water temperature preference for juvenile rearing	Range of suitable, preferred, or reported optimal water temperatures. Indicate whether literature, observational, or experimental derivation.		
water velocity ranges for rearing juveniles	Reported range of observed (minimum and maximum) water velocity utilization.		
water velocities preferred by rearing juveniles	Reported range of most frequently observed water velocity utilization.		
water depth range for juvenile rearing	Reported range of observed (minimum and maximum) water depth utilization.		
water depth preference for juvenile rearing	Reported range of most frequently observed water depth utilization.		

Element	Element Descriptor	General	Feather River Specific
cover preferences for rearing juveniles	Type of cover for protection from predators used by rearing juveniles (e.g. crevices, submerged aquatic vegetation, overhanging vegetation, substrate cover, undercover bank, small woody debris, large woody debris).		
food base of juveniles	Indicate primary diet components. Also indicate the diet changes, if any, as growth occurs.	Redeye bass feed mainly on aquatic insects, and occasionally on mosquitofish (Moyle 2002).	
feeding habits of rearing juveniles	Indicate whether plankton eater, algae eater, bottom feeder, piscivorous, active hunter, ambush predator, filter feeder. Night, day, dusk or dawn feeder. Also indicate change of feeding habits growth occurs.	Redeye bass use bold feeding tactics; they utilize rapid rushes in pursuit of prey, cruise about looking for prey, and ambush prey from cover (Moyle 2002).	
Juvenile emigration			
time spent in fresh water prior to emigrating	Duration (in years and/or months) from emergence to emigration to the ocean.	N/A	
water temperature tolerances during emigration	Range of water temperatures allowing survival. Indicate stressful or lethal levels.	N/A	
water temperature preferences during emigration	Range of suitable, preferred or reported optimal water temperatures. Indicate whether literature, observational, or experimental derivation.	N/A	
emigration timing range	Time of year juveniles commence emigration and duration of emigration.	N/A	
emigration timing peak	Time of year most juveniles are emigrating.	N/A	
size range of juveniles during emigration	Minimum and maximum sizes (inches or mm) of emigrating juveniles. Indicate average size.	N/A	

Element	Element Descriptor	General	Feather River Specific
factors associated with emigration	Pulse flows, water temperature changes, turbidity levels, photoperiod, etc.	N/A	
Other potential factors			
DO	Levels of dissolved oxygen in water expressed in mg/l tolerated by fish.		
pH	Alkalinity/acidity of water (expressed in pH) that fish can tolerate.		
turbidity	Indicate turbidity or state of water (e.g., clear water or presence of siltation or organic/inorganic matter in water) that fish can tolerate.		
factors contributing to mortality	e.g., fishing/angling mortality, drastic habitat alterations, unfavorable climatic changes, etc.	Fishing/angling contributes to redeye bass mortality (Moyle 2002).	

References

Moyle, P. B. 2002. Inland Fishes of California. Berkeley: University of California Press, 407 pgs.
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